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EVALUATION OF PROCESSING TOMATO BREEDING LINES AND CULTIVARS FOR MECHANICAL HARVESTING AND QUALITY IN 1977

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In Ohio tomatoes continue to be the most important processed crop with planted a acreage of 22,000 acres and one-half million ton production; ranking second only to California. The transition to new field production methods, and new processing practices continues to create needs for a choice of better suited varieties. This research continues to be especially directed toward improvement of the whole-pack product. Also, of importance is the development of improved types for use in juice, sauce and paste.

To enable more effective usage of present yield potentials and to insure increased yields, attributes being selected for include earlier maturity, good fruit setting, ability to overcome the problems associated with split fruit set, crack resistance and ability of ripe fruit to store well on the vine for extended periods and firmness to allow efficient mechanical harvest-bulk handling. To reduce production costs major emphasis is being given toward incorporation of jointless pedicel to facilitate machine harvest and allow delivery of fruit free of stems. Improved quality factors being selected for include acidity, pH, solids, color, and, in particular, attributes conditioning suitability to coreless wholepack product.

Progress continues in the development of varieties more adapted to machine harvest, but the need for a greater choice of suitable types remains. New lines and varieties from other sources were also included in these studies.

CULTURAL INFORMATION

Plants: Greenhouse-grown, 108 per standard flat from seed sown March 2.

Transplanted to Field: May 23, the two-row transplanter using 21-53-0 starter at 5 lb. per 100 gal. of water; 1/2 pint per plant.

Fertilizer: 1200 lb. per acre of 0-26-26 broadcast October 23. 70 units of nitrogen in Urea form applied April 15.

Soil: Hoytville clay-Fall bedded November 11.

Herbicide: Vegiben 10% granules, 40 lb. per acre 2 weeks after transplanting.

Plot Size and Spacing: One row plots, 20 plants per row spaced 12 inches in rows 5 feet apart. Four replications.

Irrigation: June 2, 0.6" applied; June 3, 1.9" applied; June 22, 1.9" applied.

* Assistance is acknowledged of J. H. Trotter, P. E. Houdashelt and staff, Northwestern Branch and P. D. Franks, Technician, OARDC; and the Processing-Technology assistants.

Insect and Disease Control: Air blast sprayer application according to recommendation of Manzate 200, Tribasic copper, Bravo 6F, Thiodan 2EC, Cythion 5E, and Sevin (WP) as follows:

Date	Material & Rate/Acre
July 4	4 lbs. fixed copper + 2 lbs. Manzate + 2 qts. Thiodan.
July 13	2 pts. Bravo 6F
July 23	2 pts. Bravo 6F + 2 lbs. Sevin
August 1	2 pts. Bravo 6F + 2 qt. Thiodan
August 14	2 pts. Bravo 6F + 2 lbs. Sevin
August 28	2 pts. Bravo 6F + 1 qt. Thiodan

HARVEST INFORMATION

May and June were characterized by sub-normal rainfall. In early June sprinkler irrigation totaling 2.5 inches of water was applied and in late June 1.9 inches. Normal moisture and temperatures through July resulted in excellent crop development, however, below average temperature in August and excess moisture through the remainder of the season delayed maturity and resulted in reduced once-over machine harvest yields.

Harvesting was with an FMC Tomato Harvester and was carried out when the entries were estimated to be at a stage of fruit ripeness in which yields of marketable fruit were approaching optimum recovery (Table 1). Percentages reported of fruit recovery are on a weight basis.

Fruit quality was determined by evaluation of hand harvested samples from each plot.

QUALITY EVALUATION

Ten field run tomatoes were selected and used for quality evaluation; the sample was cut in half, quartered, extracted in a Food Processing Equipment Co. Laboratory pulper, and de-aerated:

1. Hunter Color and Color Difference Meter; standardized with L = 25.59, aL = 27.40 and bL = 12.54 plates.

2. Agtron E-5. Instrument calibrated at 48.

3. Hunter D-6 Tomato Colorimeter (TCM).

4. Percent soluble solida. Abbe refractometer.

5. Percent total acid as citric. The raw sample used for pH determination was directly titrated using 0.1 normal sodium hydroxide solution to a pH of 8.1.

6. pH was determined by the glass electrode method.

7. Vitamin C (ascorbic acid) standard procedure:

$$\text{Dye factor} \times \text{ml. of dye} \times 100 = \frac{\text{mgs. Vitamin C}}{100 \text{ gms}}$$

NEW PROMISING OHIO ADVANCED BREEDING LINES

The advanced lines O 7630, O 7663. O 7667, and O 7681 continued their good performance in 1977. O 7630 exhibited especially good fruit size for hand or machine harvest, holding characteristics, productivity and quality being primarily a product type. O 7663 is a jointless, early, productive, coreless whole-pack type for hand or machine harvest. O 7667 with Verticillium, as well as Fusarium resistance, has performed well as a productive, high quality coreless type, also for hand or machine harvest. Seed of these lines is available for commercial trial in 1978.

In addition, the past season breeding line O 7681 has shown much promise in Center, as well as commercial trial. It is a Verticillium-Fusarium resistant, firm, large-fruited, high quality type for hand or machine harvest primarily adapted for product.

Several new lines are available which exhibit potential for improvement in productivity and quality over present varieties (Table 1 and 2). These lines will be more extensively tested and are being used in crossing to develop newer types with more desirable combinations of productivity and quality utilizing the highest levels of these factors available in a range of different breeding backgrounds and maturities.

NEW VARIETIES

Ohio 736, in several commercial trials Ohio 736 continued to perform well in regard to earliness, productivity, suitability for machine harvest, improved corelessness and peelability.

Wakefield (USDA), a new, early, jointless, coreless variety was productive, but deficiency in concentration of set necessitated late harvest for machine. Medium firmness, small fruit size and a tendency to low solids are limiting.

UC 82A, UC 82B, and UC 82C, new University of California square-round releases, had good fruit concentration. UC 82A was earlier than the UC 82B or C. Excessively dense vine cover, only fair crack resistance and low solids are limitations.

SEED SOURCES

1. University of California, Dept. Vegetable Crops, Davis, Calif.
2. Campbell Institute for Agricultural Research, Cinnaminson, N. J.
3. A. L. Castle Seed Co., Inc., Morgan Hill, Calif.
4. Ohio Agricultural Research & Development Center, Wooster, Oh.
5. Peto Seed Co., Inc., P O Box 4206, Saticoy, Calif.
6. Purdue University, Department of Horticulture, West Lafayette, Ind.
7. United States Dept. of Agr., A.R.S., Northeastern Reg., Beltsville, Md.

TABLE 1.--Field Evaluation of Processing Tomato Varieties and Test Lines for Mechanical Harvest When Yields of Marketable Fruit Were Approaching Optimum Recovery, Northwestern Branch, OARDC, Custar, Ohio 1977

Variety or Test Line	Seed Source	Ripe Usable Tons/A	Ripe Usable % of Potential	Fruit Size (oz.)	Stems %	Fruit Shape	Stem Scar (in.)	Fruit Core
Harvest Date 9/9/77								
O 7784	4	29.2	88	2.0	12	Oblong	1/6-1/4	S
PU 74-74	6	25.6	73	2.0	14(j2)	Pear	1/6-1/4	S
O 76156	4	25.3	77	1.8	45	Oblong	1/6-1/4	M
O 7678	4	25.2	78	2.0	49	Oblong	1/6-1/4	S
O 7724	4	24.2	73	2.8	1 (j2)	Globe	1/4-1/3	S
O 76123	4	24.1	86	2.8	1 (j2)	Oblong	1/4-1/3	S
O 7669	4	23.5	81	2.3	42	Globe	1/6-1/4	S
O 7635	4	23.4	80	2.7	70	Globe	1/4-1/3	S
OHIO 736	4	22.6	83	2.7	66	Globe	1/4-1/3	S
O 7774	4	22.2	80	2.4	0 (j2)	Oblong	1/4-1/3	S
O 7726	4	21.8	90	1.6	14	Oblong	1/6-1/4	S
Castleblock	3	21.3	68	2.2	14	Oblong	1/4-1/3	S
O 7664	4	20.6	83	2.4	2 (j2)	Oblong	1/6-1/4	S
UC 82A	1	20.6	81	2.4	7	Oblong	1/4-1/3	M
O 76122	4	20.4	85	2.5	1 (j2)	Oblong	1/4-1/3	S
O 7723	4	19.5	85	2.4	3 (j2)	Oblong	1/4-1/3	S
Campbell 28	5	17.5	81	3.3	70	Globe	1/3-1/2	M
Harvest Date 9/12/77								
O 76123	4	29.8	78	2.8	1 (j2)	Oblong	1/4-1/3	S
O 7715	4	28.8	80	4.0	48	Globe	1/4-1/3	S
O 7667	4	28.7	77	2.5	62	Globe	1/6-1/4	S
O 7731	4	28.3	91	1.8	52	Oblong	1/6-1/4	S
O 7630	4	28.0	81	3.2	62	Oblong	1/4-1/3	S
O 7636	4	26.6	87	2.3	56	Globe	1/4-1/3	S
O 7782	4	26.4	90	1.7	57	Oblong	1/6-1/4	S
O 7780	4	26.1	93	1.8	64	Oblong	1/6-1/4	S
O 7668	4	25.7	92	1.8	64	Oblong	1/6-1/4	S
O 76151	4	25.3	79	2.3	46	Globe	1/4-1/3	S
O 7759	4	24.3	93	2.4	5 (j2)	Globe	1/4-1/3	S
Chico III	5	23.3	96	2.0	13	Pear	1/6-1/4	S
O 7663	4	20.4	95	2.4	1 (j2)	Oblong	1/6-1/4	S
Harvest Date 9/19/77								
O 7733	4	30.9	81	4.1	86	Globe	1/4-1/3	M
O 7681	4	27.4	79	4.1	77	Globe	1/4-1/3	S
Wakefield	7	26.4	83	1.9	1 (j2)	Oblong	1/6-1/4	S
O 7786	4	25.0	74	2.9	9	Oblong	1/6-1/4	S
O 7785	4	24.7	91	2.5	35	Globe	1/6-1/4	S
Red Rock	7	24.5	80	3.0	9 (j2)	Globe	1/4-1/3	S
Campbell 38	2	24.3	90	3.3	5 (j2)	Oblong	1/4-1/3	S
UC 82B	1	24.2	81	2.5	6	Oblong	1/4-1/3	M
Campbell 37	2	23.5	87	2.5	5 (j2)	Oblong	1/4-1/3	S
UC 82C	1	17.9	83	2.5	9	Oblong	1/4-1/3	M
LSD @ %5		4.6	7	0.4	16			

TABLE 2.--Laboratory Evaluation of Processing Tomato Varieties and Test Lines, Northwestern Branch, OARDC, Custar, Ohio, 1977

Variety or Test Line	pH	% Citric Acid	% Soluble Solids	Color Hunter CDM a/b	Color Agtron E5	Color Hunter D6 TCM	Vit. C
O 7784	4.57	0.34	4.45	2.56	28	77	20.5
PU 74-74	4.59	0.33	4.72	2.79	27	82	24.0
O 76156	4.56	0.36	4.60	2.54	26	82	24.5
O 7678	4.57	0.35	4.68	2.68	24	80	23.1
O 7724	4.59	0.32	4.38	2.48	30	75	22.0
O 76123	4.59	0.32	4.40	2.58	32	77	21.4
O 7669	4.68	0.28	4.53	2.63	25	81	25.2
O 7635	4.51	0.35	4.45	2.59	25	79	22.0
OHIO 736	4.48	0.39	4.65	2.59	26	79	23.4
O 7774	4.59	0.33	4.83	2.51	30	80	20.6
O 7726	4.60	0.29	4.83	2.62	24	80	23.1
Castleblock	4.58	0.31	4.20	2.50	26	78	22.1
O 7664	4.56	0.35	4.70	2.61	27	78	19.8
UC 82A	4.54	0.31	3.90	2.55	27	81	17.5
O 76122	4.58	0.33	4.60	2.57	27	77	19.2
O 7723	4.56	0.32	4.58	2.56	27	77	20.2
Campbell 28	4.51	0.38	4.73	2.53	27	78	25.4
O 76123	4.64	0.33	4.48	2.63	31	75	19.8
O 7715	4.57	0.30	4.10	2.57	25	80	19.6
O 7667	4.35	0.31	4.88	2.66	27	77	23.0
O 7731	4.58	0.32	4.45	2.57	25	80	24.8
O 7630	4.48	0.37	4.78	2.53	28	76	19.4
O 7636	4.49	0.33	4.13	2.53	27	77	26.0
O 7782	4.51	0.33	4.68	2.59	24	80	23.0
O 7780	4.60	0.29	4.35	2.54	24	81	26.0
O 7668	4.59	0.34	4.40	2.57	24	81	25.6
O 76151	4.47	0.39	4.93	2.69	24	81	23.5
O 7759	4.54	0.35	4.58	2.57	26	76	20.0
Chico III	4.56	0.29	4.63	2.53	25	79	19.6
O 7663	4.48	0.36	4.55	2.56	26	76	18.9
O 7733	4.62	0.26	4.23	2.63	28	81	19.5
O 7681	4.58	0.28	4.42	2.69	27	79	20.0
Wakefield	4.52	0.34	4.10	2.41	34	74	19.7
O 7786	4.53	0.32	4.50	2.57	27	78	18.3
O 7785	4.53	0.32	4.53	2.54	27	77	19.7
Red Rock	4.54	0.32	4.60	2.56	31	76	22.1
Campbell 38	4.54	0.36	4.88	2.68	30	77	23.5
UC 82B	4.50	0.33	4.25	2.60	26	81	20.9
Campbell 37	4.46	0.38	4.75	2.59	26	77	21.5
UC 82C	4.50	0.29	4.00	2.55	25	80	19.8
LSD @ 5%	NSD	.04	0.28	0.11	3	3	3.2

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